

Appln No. 09/692,554
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Reply to Office action of September 22, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for detecting a tone in a composite signal having a plurality of components comprising:
separating one of the components from the composite signal;
sampling a portion of the separated component; and
detecting from a the sampled portion of the separated component whether the separated component comprises the tone.
2. (Cancelled)
3. (Currently Amended) The method of claim 1 further comprising formatting the separated component into a frame having first and second portions ~~frames~~, and wherein the tone detection comprises detecting from the second portion of the frame whether the separated component comprises the tone.
4. (Original) The method of claim 3 wherein the first portion of the frame precedes the second portion of the frame in time.
5. (Currently Amended) The method of claim 1 further comprising formatting the separated component into first and

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second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, and wherein the tone detection comprises detecting from the second portion of the first frame whether the separated component comprises a the tone.

6. (Original) The method of claim 5 wherein the first portion precedes the second portion in time for each of the first and second frames.

7. (Currently Amended) The method of claim 1 further comprising formatting the separated component into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, the first portion of the frame precedes the second portion of the frame in time for each of the first and second frames, and bypassing the tone detection step for the first portion of the second frame if the tone detection does not detect the tone in the second portion of the first frame.

8. (Previously Presented) A method of dual tone signal detection in a composite signal having first and second components, comprising:

separating the composite signal into its first and second components;

detecting from a portion of the first component whether the first component comprises a first one of the dual tones; and

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detecting from a portion of the second component whether the second component comprises a second one of the dual tones.

9. (Previously Presented) The method of claim 8 further comprising formatting the first component into a frame having first and second portions, and wherein the detection of the first one of the dual tones comprises detecting from the second portion of the frame whether the first component comprises the first one of the dual tones.

10. (Original) The method of claim 9 wherein the first portion of the frame precedes the second portion of the frame in time.

11. (Previously Presented) The method of claim 8 further comprising formatting the first component into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, and wherein the detection of the first one of the dual tones comprises detecting from the second portion of the first and second frames whether the first component comprises the first one of the dual tones.

12. (Original) The method of claim 11 wherein the first portion precedes the second portion in time for each of the first and second frames.

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13. (Currently Amended) The method of claim 8 further comprising formatting the first component into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, the first portion of the frame precedes the second portion of the ~~same~~ frame in time for each of the first and second frames, and bypassing the detection step of the first one of the dual tones for the first portion of the second frame if the detection for the first one of the dual tones does not detect the first one of the dual tones in the second portion of the first frame.

14. (Currently Amended) A method of detecting a tone in a composite signal having first and second components, comprising:

separating the composite signal into its first and second components;

determining a frequency for each of the first and second components; and

detecting as a function of the determined frequency for each of the first and second components whether either of the first and second components comprises the tone.

15. (Previously Presented) The method of claim 14 wherein the tone detection comprises comparing the determined frequency of each of the separated first and second components to a plurality of frequency ranges to determine whether either of the first and second components comprises the tone.

16. (Cancelled)

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17. (Original) The method of claim 14 wherein the composite signal separation comprises bandpass filtering the composite signal into its first and second components.

18. (Original) The method of claim 17 wherein the frequency determination comprises down-sampling the filtered first and second components.

19. (Original) The method of claim 17 wherein the composite signal bandpass filtering comprises complex filtering.

20. (Original) The method of claim 14 wherein the frequency determination comprises converting the separated first and second components into complex signals.

21. (Previously Presented) The method of claim 79 wherein the tone detection further comprises comparing a ratio of the power estimation for the first and second components to a threshold.

22. (Canceled)

23. (Previously Presented) The method of claim 14 wherein the frequency determination further comprises estimating a mean frequency deviation from one of a plurality of frequencies for each of the first and second components and comparing each of the estimated means to a respective threshold.

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24.-26. (Cancelled)

27. (Previously Presented) The tone detection system of claim 81 wherein the separated component comprise first and second portions, the tone detection system further comprising a state machine to invoke the detector to detect the tone in the second portion of the separated component.

28. (Original) The tone detection system of claim 27 wherein the first portion precedes the second portion in time.

29. (Previously Presented) The tone detection system of claim 81 wherein the separated component comprise first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, the tone detection system further comprising a state machine to invoke the detector to detect the tone in the second portion of the first frame, and to invoke the detector to process the tone in the first portion of the second frame only if the detector detects the tone in the second portion of the first frame.

30. (Original) The tone detection system of claim 29 wherein the first portion precedes the second portion in time for each of the first and second frames.

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31. (Previously Presented) A system for detecting a tone in a composite signal having first and second components, comprising:

separating means for separating the composite signal into its first and second components;

determination means for determining a frequency for each of the separated first and second components; and

detection means for detecting as a function of the determined frequency for each of the first and second components whether either of the first and second components comprises the tone.

32. (Cancelled)

33. (Previously Presented) The system of claim 31 wherein the determination means comprises means for estimating a mean frequency deviation from one of a plurality of frequencies for each of the first and second components and comparing the mean of each of the first and second components to a respective threshold.

34. (Previously Presented) The system of claim 31 further comprising means for converting the first and second components to complex signals prior to the frequency determination

35. (Previously Presented) The system of claim 31 wherein the separating means comprises a first bandpass filter to pass

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the first component and a second bandpass filter to pass the second component.

36. (Currently Amended) The ~~dual tone detection~~ system of claim 35 wherein each of the bandpass filters comprises a complex filter.

37. (Currently Amended) The ~~dual tone detection~~ system of claim 31 further comprising means for downsampling the separated first and second components prior to the frequency determination.

38. (Currently Amended) The ~~dual tone detection~~ system of claim 31 wherein the detection means comprises means for comparing the determined frequency of each of the first and second components to a plurality of frequency ranges to determine whether either of the first and second components comprises the tone.

39. (Currently Amended) A system of detecting a dual tone in a composite signal having first and second components, comprising:

a first bandpass filter to separate the first component from the composite signal;

a second bandpass filter to separate the second component from the composite signal;

a first detector to determine a frequency of the separated first component;

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a second detector to determine frequency of the separated second component;

a first comparator to compare the frequency of the first component to at least one of a plurality of frequency ranges to determine whether the separated first component comprises one of the dual tones; and

a second comparator to compare the frequency of the separated second component to at least one of the frequency ranges to determine whether the second component comprises the other one of the dual tones.

40. (Cancelled)

41. (Previously Presented) The dual detection system of claim 39 wherein each of the first and second comparators comprises a frequency calculator that estimates a mean frequency deviation from one of a plurality of frequencies for each of the separated first and second components and compares the mean of each of the separated first and second components to a respective threshold.

42. (Currently Amended) The dual detection system of claim 39 further comprising a first summer to convert the separated first component to a ~~first component~~ to a first complex signal prior to the frequency determination by the first detector, and a second summer to convert the separated second component to a second complex signal prior to the frequency determination by the second detector.

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43. (Original) The dual tone detection system of claim 39 wherein each of the first and second bandpass filters comprises complex filters.

44. (Previously Presented) The dual tone detection system of claim 39 further comprising a first downampler to downsample the separated first component prior to the frequency determination by the first detector, and a second downampler to downsample the separated second component prior to the frequency determination by the second detector.

45. (Cancelled)

46. (Currently Amended) Computer-readable media embodying a program of instructions executable by a computer to perform a method for detecting a tone in a composite signal having a plurality of components, the method comprising:

separating one of the components from the composite signal;

sampling a portion of the separated component; and
detecting from a the sampled portion of the separated component whether the separated component comprises a the tone.

47. (Cancelled)

48. (Previously Presented) The computer-readable media of claim 46 wherein the method further comprises formatting the

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separated component into a frame having first and second portions, and wherein the tone detection comprises detecting from the second portion of the frame whether the separated component comprises the tone.

49. (Original) The computer-readable media of claim 48 wherein the first portion of the frame precedes the second portion of the frame in time.

50. (Previously Presented) The computer-readable media of claim 46 wherein the method further comprises formatting the separated component into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, and wherein the tone detection comprises detecting from the second portion of the first frame whether the separated component comprises the tone.

51. (Original) The computer-readable media of claim 50 wherein the first portion precedes the second portion in time for each of the first and second frames.

52. (Currently Amended) The computer-readable media of claim 46 wherein the method further comprises formatting the separated component into first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and second portions, the first portion of the frame precedes the second portion of the frame in

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time for each of the first and second frames, and bypassing the tone detection step for the first portion of the second frame if the tone detection does not detect the tone in the second portion of the first frame.

53. (Previously Presented) Computer-readable media embodying a program of instructions executable by a computer to perform a method for detecting a tone in a composite signal having first and second components, the method comprising:

separating the composite signal into its first and second components;

determining frequency for each of the first and second components; and

detecting as a function of the determined frequency for each of the first and second components whether either of the first and second components comprises the tone.

54. (Previously Presented) The computer-readable media of claim 53 wherein the tone detection comprises comparing the determined frequency of each of the separated first and second components to a plurality of frequency ranges to determine whether either of the first and second components comprises the tone.

55. (Cancelled)

56. (Original) The computer-readable media of claim 53 wherein the composite signal separation comprises bandpass

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filtering the composite signal into its first and second components.

57. (Original) The computer-readable media of claim 56 wherein the frequency determination comprises down-sampling the filtered first and second components.

58. (Original) The computer-readable media of claim 56 wherein the composite signal bandpass filtering comprises complex filtering.

59. (Original) The computer-readable media of claim 53 wherein the frequency determination comprises converting the separated first and second components into complex signals.

60. (Previously Presented) The computer-readable media of claim 88 wherein the tone detection further comprises comparing a ratio of the power estimation for the first and second components to a threshold.

61. (Cancelled)

62. (Previously Presented) The computer-readable media of claim 53 wherein the frequency determination further comprises further comprising estimating a mean of frequency deviation from one of a plurality of frequencies for each of the first and second components to a respective threshold.

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63. (Cancelled)

64. (Currently Amended) A data transmission system, comprising:

a telephony device having a composite signal output comprising a plurality of components; and

a signal processing system coupled to the telephony device, the signal processing system comprising a detector to separate one of the components from the composite signal, sample a portion of the separated component, and detect from a the sampled portion of the separated component whether the separated component comprises a tone.

65. (Cancelled)

66. (Currently Amended) The data transmission system of claim 64 wherein the separated component comprises first and second portions, and the signal processing system further comprising a state machine to invoke the detector to detect the tone in the second portion of the samples separated component.

67. (Original) The data transmission system of claim 66 wherein the first portion precedes the second portion in time.

68. (Previously Presented) The data transmission system of claim 64 wherein the separated component comprise first and second frames, the first frame preceding the second frame in time, each of the first and second frames having first and

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second portions, and wherein the signal processing system further comprising a state machine to invoke the detector to detect the tone in the second portion of the first frame, and to invoke the detector to process the tone in the first portion of the second frame only if the detector detects a tone in the second portion of the first frame.

69. (Original) The data transmission system of claim 68 wherein the first portion precedes the second portion in time for each of the first and second frames.

70. (Original) The data transmission system of claim 64 wherein the telephony device comprises a telephone.

71. (Previously Presented) A system for transmitting a dual tone, comprising:

a telephony device having a composite signal output comprising first and second components; and

a signal processing system coupled to the telephony device, the signal processing system comprising,

a first bandpass filter to separate the first component from the composite signal,

a second bandpass filter to separate the second component from the composite signal,

a first power estimator to estimate power of the separated first component,

a second power estimator to estimate power of the separated second component,

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a first detector to determine frequency of the separated first component,

a second detector to determine frequency of the separated second component, a first comparator to compare the estimated power and determined frequency of the first component respectively to a power threshold and frequency range to determine whether the first component comprises one of the dual tones, and

a second comparator to compare the estimated power and determined frequency of the second component respectively to a power threshold and frequency range to determine whether the second component comprises the other one of the dual tones.

72. (Cancelled)

73. (Previously Presented) The data transmission system of claim 71 wherein each of the first and second comparators comprises a frequency calculator that estimates a mean deviation to one of a plurality of frequencies for each of the separated first and second components and compares the estimated mean for each of the separated first and second components to a respective threshold.

74. (Previously Presented) The data transmission system of claim 71 wherein the signal processing system further comprising a first summer to convert the separated first component to a first complex signal prior to the first power estimation and

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frequency determination, and a second summer to convert the separated second component to a second complex signal prior to the second power estimation and frequency determination.

75. (Original) The data transmission system of claim 71 wherein each of the first and second bandpass filters comprises complex filters.

76. (Original) The data transmission system of claim 71 wherein the signal processing system further comprising a first downampler to downsample the separated first component prior to the first power estimation and frequency determination, and a second downampler to downsample the separated second component prior to the second power estimation and frequency determination

77. (Cancelled)

78. (Previously Presented) The method of claim 14 further comprising estimating a characteristic different from the frequency for each of the first and second components, wherein the tone detection is further a function of the estimated characteristic.

79. (Previously Presented) The method of claim 78 wherein the characteristic comprises power.

80. (Previously Presented) The method of claim 79 wherein the tone detection further comprises comparing the estimated

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power for each of the first and second components to a threshold.

81. (Currently Amended) A system for detecting a tone in a composite signal having a plurality of components comprising:

a filter to separate one of the components from the composite signal;

a sampler to sample a portion of the separated component; and

a detector to detect from a the sampled portion of the separated component whether the separated component comprises the tone.

82. (Previously Presented) The system of claim 31 further comprising means for estimating a characteristic of each of the first and second components, the detection means detecting whether either of the first and second components comprises the tone further as a function of the estimated characteristic for each of the first and second components.

83. (Previously Presented) The system of claim 82 wherein the characteristic comprises power.

84. (Previously Presented) The system of claim 31 further comprising means for estimating power of each of the first and second components, the detection means detecting whether either of the first and second components comprises the tone further as

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a function of a ratio of the estimated power of the first and second components.

85. (Previously Presented) The system of claim 39 further comprising a first power estimator to the estimate power of the separated first component, the first comparator further comparing the estimated power of the separated first component to a power threshold, the determination of whether the separated first signal comprises said one of the tones being further a function of the comparison.

86. (Previously Presented) The system of claim 39 further comprising first and second power estimators each estimating power of a respective one of the first and second separated components, and a twist estimator to compare a ratio of the estimated power for the first and second components, the determination of whether the composite signal comprises the dual tone being further a function of the comparison.

87. (Previously Presented) The computer-readable media of claim 53 wherein the method further comprises estimating a characteristic different from the frequency for each of the first and second components, wherein the tone detection is further a function of the estimated characteristic.

88. (Previously Presented) The computer-readable media of claim 87 wherein the characteristic comprises power.